

AD-A182 009

INTEGRATED INFORMATION SUPPORT SYSTEM (IIS) VOLUME 5

1/1

COMMON DATA MODEL S... (U) GENERAL ELECTRIC CO

SCHENECTADY NY PRODUCTION RESOURCES CONSU

UNCLASSIFIED

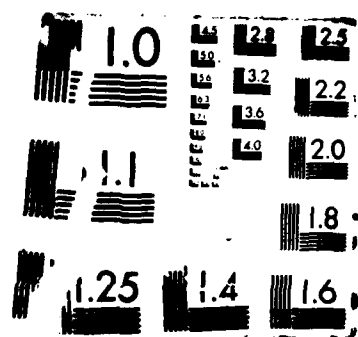
M L APICELLA ET AL. 01 NOV 85 PS-620141255 F/G 12/3

NL

END

10-95

R



AD-A182 009

DTIC FILE COPY

2

**AFWAL-TR-86-4006
Volume V
Part 20**



**INTEGRATED INFORMATION
SUPPORT SYSTEM (IISS)
Volume V - Common Data Model Subsystem
Part 20 - NDML Precompiler Generate Codasyl Request Processor
Product Specification**

**General Electric Company
Production Resources Consulting
One River Road
Schenectady, New York 12345**

**Final Report for Period 22 September 1980 - 31 July 1985
November 1985**

Approved for public release; distribution is unlimited.

PREPARED FOR:

**MATERIALS LABORATORY
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AFB, OH 45433-6533**

**DTIC
ELECTE
JUL 02 1987
S D
E**

87 6 30 115

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

1 November 1985

REPORT DOCUMENTATION PAGE

1. REPORT SECURITY CLASSIFICATION Unclassified		10. RESTRICTIVE MARKINGS A182 009									
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.									
7a. DECLASSIFICATION/DOWNGRADING SCHEDULE		5. MONITORING ORGANIZATION REPORT NUMBER(S) AFVAL-TR-86-4006 Vol V, Part 20									
4. PERFORMING ORGANIZATION REPORT NUMBER(S)		7b. NAME OF MONITORING ORGANIZATION AFVAL/MLTC									
6a. NAME OF PERFORMING ORGANIZATION General Electric Company Production Resources Consulting	6b. OFFICE SYMBOL (if applicable) AFVAL/MLTC	7c. ADDRESS (City, State and ZIP Code) WPAFB, OH 45433-6533									
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Materials Laboratory Air Force Systems Command, USAF		8. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F33619-80-C-3155									
8c. ADDRESS (City, State and ZIP Code) Wright-Patterson AFB, Ohio 45433		10. SOURCE OF FUNDING NOS. <table border="1"><tr><td>PROGRAM ELEMENT NO.</td><td>PROJECT NO.</td><td>TASK NO.</td><td>WORK UNIT NO.</td></tr><tr><td>78011F</td><td>7500</td><td>62</td><td>01</td></tr></table>		PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT NO.	78011F	7500	62	01
PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT NO.								
78011F	7500	62	01								
11. TITLE (Include Security Class Action) (See Reverse)											
12. PERSONAL AUTHOR(S) Apicella, M. L. and Bradley, W. J.											
13a. TYPE OF REPORT Final Technical Report	13b. TIME COVERED 22 Sept 1980 - 31 July 1985	14. DATE OF REPORT (Yr., Mo., Day) 1985 November	15. PAGE COUNT 72								
16. SUPPLEMENTARY NOTES ICAM Project Priority 6201 The computer software contained herein are theoretical and/or references that in no way reflect Air Force-owned or -developed computer software.											
17. COSAT CODES <table border="1"><tr><td>FIELD</td><td>GROUP</td><td>SUB GR</td></tr><tr><td>1308</td><td>0805</td><td></td></tr></table>		FIELD	GROUP	SUB GR	1308	0805		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)			
FIELD	GROUP	SUB GR									
1308	0805										
19. ABSTRACT (Continue on reverse if necessary and identify by block number) This document is the product specification establishing the design implementation of the IISS Configuration Item PRE9.3 which will generate a processor to satisfy data requests for a CODASYL database.											
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS <input type="checkbox"/>		21. ABSTRACT SECURITY CLASSIFICATION Unclassified									
22a. NAME OF RESPONSIBLE INDIVIDUAL David L. Judson		22b. TELEPHONE NUMBER (Include Area Code) 513-385-8876	22c. OFFICE SYMBOL AFVAL/MLTC								

DO FORM 1473, 63 APR

EDITION OF 1 JAN 75 IS OBSOLETE.

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE

11. Title

Integrated Information Support System (IISS)
Vol V - Common Data Model Subsystem
Part 20 - NDML Precompiler Generate Codasyl Request
Processor Product Specification

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



PREFACE

This product specification covers the work performed under Air Force Contract F33615-80-C-5155 (ICAM Project 6201). This contract is sponsored by the Materials Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. It was administered under the technical direction of Mr. Gerald C. Shumaker, ICAM Program Manager, Manufacturing Technology Division, through Project Manager, Mr. David Judson. The Prime Contractor was Production Resources Consulting of the General Electric Company, Schenectady, New York, under the direction of Mr. Alan Rubenstein. The General Electric Project Manager was Mr. Myron Hurlbut of Industrial Automation Systems Department, Albany, New York.

Certain work aimed at improving Test Bed Technology has been performed by other contracts with Project 6201 performing integrating functions. This work consisted of enhancements to Test Bed software and establishment and operation of Test Bed hardware and communications for developers and other users. Documentation relating to the Test Bed from all of these contractors and projects have been integrated under Project 6201 for publication and treatment as an integrated set of documents. The particular contributors to each document are noted on the Report Documentation Page (DD1473). A listing and description of the entire project documentation system and how they are related is contained in document FTR620100001, Project Overview.

The subcontractors and their contributing activities were as follows:

TASK 4.2

Subcontractors

Role

Boeing Military Aircraft
Company (BMAC)

Reviewer.

D. Appleton Company
(DACOM)

Responsible for IDEF support,
state-of-the-art literature
search.

General Dynamics/
Ft. Worth

Responsible for factory view
function and information
models.

PS 620141255
1 November 1985

<u>Subcontractors</u>	<u>Role</u>
Illinois Institute of Technology	Responsible for factory view function research (IITRI) and information models of small and medium-size business.
North American Rockwell	Reviewer.
Northrop Corporation	Responsible for factory view function and information models.
Pritsker and Associates	Responsible for IDEF2 support.
SofTech	Responsible for IDEFO support.

TASKS 4.3 - 4.9 (TEST BED)

<u>Subcontractors</u>	<u>Role</u>
Boeing Military Aircraft Company (BMAC)	Responsible for consultation on applications of the technology and on IBM computer technology.
Computer Technology Associates (CTA)	Assisted in the areas of communications systems, system design and integration methodology, and design of the Network Transaction Manager.
Control Data Corporation (CDC)	Responsible for the Common Data Model (CDM) implementation and part of the CDM design (shared with DACOM).
D. Appleton Company (DACOM)	Responsible for the overall CDM Subsystem design integration and test plan, as well as part of the design of the CDM (shared with CDC). DACOM also developed the Integration Methodology and did the schema mappings for the Application Subsystems.

PS 620141255
1 November 1985

<u>Subcontractors</u>	<u>Role</u>
Digital Equipment Corporation (DEC)	Consulting and support of the performance testing and on DEC software and computer systems operation.
McDonnell Douglas Automation Company (McAuto)	Responsible for the support and enhancements to the Network Transaction Manager Subsystem during 1984/1985 period.
On-Line Software International (OSI)	Responsible for programming the Communications Subsystem on the IBM and for consulting on the IBM.
Rath and Strong Systems Products (RSSP) (In 1985 became McCormack & Dodge)	Responsible for assistance in the implementation and use of the MRP II package (PIOS) that they supplied.
SofTech, Inc.	Responsible for the design and implementation of the Network Transaction Manager (NTM) in 1981/1984 period.
Software Performance Engineering (SPE)	Responsible for directing the work on performance evaluation and analysis.
Structural Dynamics Research Corporation (SDRC)	Responsible for the User Interface and Virtual Terminal Interface Subsystems.

Other prime contractors under other projects who have contributed to Test Bed Technology, their contributing activities and responsible projects are as follows:

<u>Contractors</u>	<u>ICAM Project</u>	<u>Contributing Activities</u>
Boeing Military Aircraft Company (BMAC)	1701, 2201, 2202	Enhancements for IBM node use. Technology Transfer to Integrated Sheet Metal Center (ISMC).

PS 620141255
1 November 1985

<u>Contractors</u>	<u>ICAM Project</u>	<u>Contributing Activities</u>
Control Data Corporation (CDC)	1502, 1701	IISS enhancements to Common Data Model Processor (CDMP).
D. Appleton Company (DACOM)	1502	IISS enhancements to Integration Methodology.
General Electric	1502	Operation of the Test Bed and communications equipment.
Hughes Aircraft Company (HAC)	1701	Test Bed enhancements.
Structural Dynamics Research Corporation (SDRC)	1502, 1701, 1703	IISS enhancements to User Interface/Virtual Terminal Interface (UI/VTI).
Systran	1502	Test Bed enhancements. Operation of Test Bed.

TABLE OF CONTENTS

		<u>Page</u>
SECTION 1.0	SCOPE	1-1
1.1	Identification	1-1
1.2	Functional Summary	1-1
SECTION 2.0	DOCUMENTS	2-1
2.1	Reference Documents	2-1
2.2	Terms and Abbreviations	2-1
SECTION 3.0	REQUIREMENTS	3-1
3.1	Structural Description	3-1
3.2	Functional Flow	3-2
3.3	Interfaces	3-3
3.3.1	Inputs/Outputs	3-4
3.4	Program Interrupts	3-4
3.5	Timing and Sequencing Description	3-4
3.6	Special Control Features	3-4
3.7	Storage Allocation	3-4
3.7.1	Database Definition	3-4
3.7.1.1	File Description	3-5
3.7.1.2	Table Description	3-5
3.7.1.3	Item Description	3-5
3.8	Object Code Creation	3-5
3.9	Adaptation Data	3-5
3.10	Detail Design Description	3-5
3.10.1	Main Program List	3-5
3.10.2	Module List	3-8
3.10.3	External Routines List	3-10
3.10.4	Include File List	3-12
3.10.5	Where Include File Used List	3-14
3.10.6	Where External Routine Used List ...	3-20
3.10.7	Main Program Parts List	3-23
3.10.8	Module Documentation	3-25
3.10.9	Include File Description	3-30
3.10.10	Hierarchy Chart	3-53
3.11	Program Listings Comments	3-58
SECTION 4.0	QUALITY ASSURANCE PROVISIONS	4-1
4.1	Introduction and Definitions	4-1
4.2	Computer Programming and Test Evaluation	4-1

SECTION 1

SCOPE

1.1 Identification

This specification establishes the design of Function PRE9.3, "Generate CODASYL Request Processor", one of the major functions of the Configuration Item (CI) Precompiler to be built and formally accepted by the ICAM Program Office. This CI constitutes one of the subsystems of the Common Data Model Processor (CDMP).

1.2 Functional Summary

The purpose of this Computer Program Configuration Item (CPCI) is to generate a COBOL program that will satisfy a retrieval or update NDML subtransaction against a CODASYL database. *Keywords: ICAM (Integrated Computer Aided Management) System*

The following functions will be performed by this CPCI:

1. Generate the Data Division section of the Request Processor.
 - a) Generate file description and record layout if the NDML request resulted in a retrieval subtransaction.
2. Generate the Working Storage section of the Request Processor. These working storage variables will be used for:
 - a) Conceptual/internal transformation of retrieval search parameters or update values.
 - b) Internal/conceptual transformation of retrieved data fields.
 - c) DBMS status checks.
 - d) Retrieved qualification variables.
3. Generate the Procedure Division section of the Request Processor. It will include all the code to access a particular CODASYL database in order to satisfy the NDML request. This code will consist of:
 - a) Interface code to the Request Processor Main

PS 620141255
1 November 1985

- program at runtime.
- b) Code to transform the retrieval search parameters or update values from conceptual to internal format.
 - c) Code using DBMS specific calls to access the database to retrieve data or update data.
 - d) Code to transform the retrieved data from internal to conceptual format.
 - e) Code to save the retrieved data on a sequential file.
 - f) Code to check DBMS status and report errors during runtime execution.

SECTION 2

DOCUMENTS

2.1 Reference Documents

1. ICAM Documentation Standards: IDS15012000A, 28 December 1981.
2. D. Appleton Co., CDM Administrator's Manual; UM620141000, March 1984.
3. D. Appleton Co., CDM1-IDEF, Model of the Common Data Model; CCS620141000, 15 May 1985.
4. D. Appleton Co., Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDML Precompiler; DS620141200, October 1984.
5. D. Appleton Co., Embedded NDML Programmer's Reference Manual; PRM620141200, March 1985.
6. Softech, Inc., NTM Programmer's Guide: UM620140001, July 1984.
7. Control Data Corp., Computer Program Development Specification (DS) for ICAM Integrated Support System (IISS) Configuration Item: NDDL Command Processor; DS620141100, June 1985.

2.2 Terms and Abbreviations

Attribute Use Class: (AUC)

Conceptual Schema: (CS)

Common Data Model Processor: (CDMP)

Common Data Model: (CDM) Describes common data application process formats, form definitions, etc, of the IISS and includes conceptual schema, external, internal schemas, and schema transformation operators.

Data Field: (DF) An element of data in the external schema. It is by this name that an NDML programmer

PS 620141255
1 November 1985

references data.

Database Management System: (DBMS)

Distributed Request Supervisor: (DRS) This IISS CDM subsystem configuration item controls the execution of distributed NDML queries and non distributed updates.

Domain: A logical definition of legal attribute class values.

Domain Constraint: Predicate that applies to a single domain.

External Schema: (ES)

Forms: Structured views which may be imposed on windows or other forms. A form is composed of fields where each field is a form, item, or window.

Forms Processor: (FP) A set of callable execution time routines available to an application program for form processing.

Internal Schema: (IS)

Integrated Information Support System: (IISS) A test computing environment used to investigate, demonstrate and test the concepts of information management and information integration in the context of Aerospace Manufacturing. The IISS addresses the problems of integration of data resident on heterogeneous databases supported by heterogeneous computers interconnected via a local Area Network.

Mapping: The correspondence of independent objects in two schemas: ES to CS or CS to IS.

Network Transaction Manager: (NTM) Performs the coordination, communication and housekeeping functions required to integrate the application processes and system services resident on the various hosts into a cohesive system.

Neutral Data Manipulation Language: (NDML) A language developed by the IISS project to provide uniform access to common data, regardless of database manager or distribution criteria. It provides distributed retrieved and single

PS 620141255
1 November 1985

node updates.

ORACLE: Relational DBMS based on the SQL (Structured Query Language, a product of ORACLE Corp, Menlo Park, CA). The CDM is an ORACLE database.

Parcel: A sequential file containing section source code of the input application program.

Request Processor: (RP) A COBOL program that will satisfy a retrieval or update NDML subtransaction against a particular Database Management System.

User Interface: (UI) Controls the user's terminal and interfaces with the rest of the system.

Virtual Terminal Interface: (VTI) Performs the interfacing between different terminals and the UI. This is done by defining a specific set of terminal features and protocols which must be supported by UI software which constitutes the Virtual Terminal Definition. Specific terminals are then mapped against the Virtual Terminal software by specific software modules written for each type of real terminal supported.

SECTION 3
REQUIREMENTS

3.1 Structural Description

A graphic portrayal of this CPCI is included in Section 3.10. This chart shows the hierarchical relationships of each module making up this CPCI.

This CPCI uses a number of lower level modules to handle specific operations such as:

1. Generate conceptual schema data definitions for retrieved data fields (CDRFT).
2. Generate internal schema data definitions for runtime search parameters (CDPRM).
3. Generate internal schema data definitions for retrieved data fields (CDRDF).
4. Generate conceptual schema data definitions for runtime search parameters or update values (CDMSG).
5. Generate working storage and procedure division code for the conceptual schema to internal schema transformation of runtime search parameters or update values (CDCI).
6. Generate working storage and procedure division code for the internal schema to conceptual schema transformation of retrieved data fields (CDIC).
7. Generate internal schema data definitions for qualified data fields (CDQDF).
8. Combine two work files into one file containing the Request Processor program (CDCWF).
9. Generate macros with the proper substitution parameters (CDMACR).

PS 620141255
1 November 1985

3.2 Functional Flow

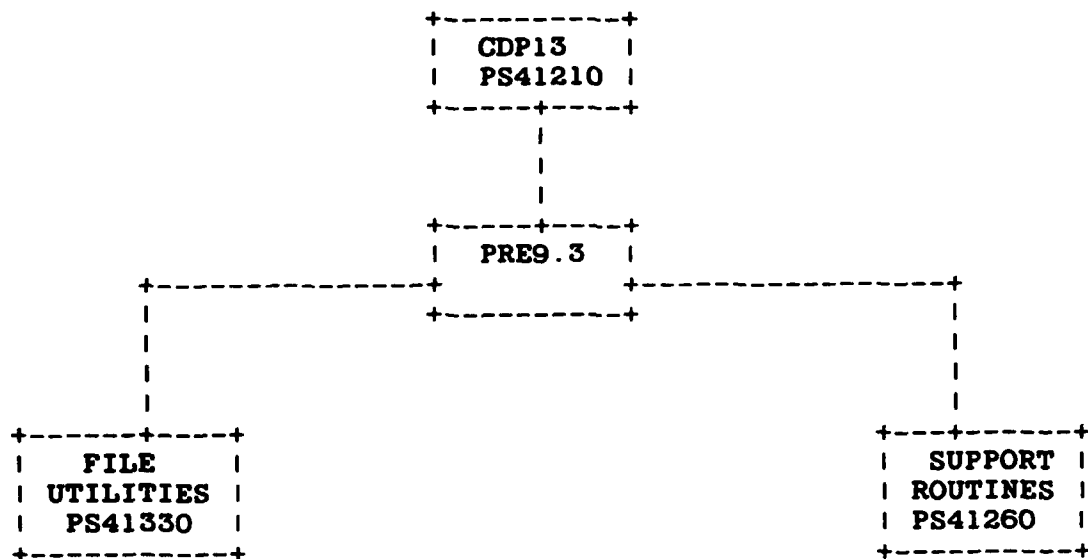
This CPCI implements the logic defined in the Development Specification for this CPCI. Details of inputs/outputs and relationships between modules are to be found in Section 3.10.

This CPCI has been designated to operate in a batch or interactive mode. It must operate in the system environment established for IISS; that is, use of the Network Transaction manager. It must use the ORACLE DBMS installed on a DEC VAX computer.

PS 620141255
1 November 1985

3.3 Interfaces

The following diagram depicts the interface of PRE9.3 with other CPCI's in the system.



3.3.1 Inputs/Outputs

The following table depicts the inputs and outputs of this CPCI. A detail description for each item can be found in the DS for this CPCI.

Function: PRE9.3

<u>INPUT</u>	<u>OUTPUT</u>
Database Identification Number	Source Code File Name
Database Name	Function Status
Database Schema Name	Database Sub-Schema Name
Database Location	Library Name
Target Host	Current Host
Request Processor Name	Current Subtransaction
Internal Schema Action List	Internal Schema Qualify List
Conceptual Schema Action List	Conceptual Schema Qualify List
Result Field Table	Generic CODASYL Command Table
Record Key Table	AP Information Table
ORACLE Logon Data Area	Error File Name

3.4 Program Interrupts

Not applicable to this CPCI.

3.5 Timing and Sequencing Description

This CPCI is called upon by the Request Processor Control Module, CDP13, for every CODASYL subtransaction identified by the current NDML request being precompiled.

3.6 Special Control Features

Not applicable to this CPCI.

3.7 Storage Allocation

3.7.1 Database Definition

The database used by this CPCI is the Common Data Model (CDM) database. This model is defined by the CDM1, the IDEF-1 model of the CDM, Reference Document Number 3. The database was constructed using the ORACLE DBMS.

3.7.1.1 File Description

No permanent files have been defined for this CPCI. It uses temporary scratch files for the generated program source code.

3.7.1.2 Table Description

All tables used by this CPCI have been defined by the Development Specification for this CPCI.

3.7.1.3 Item Description

Not applicable to this CPCI.

3.8 Object Code Creation

The object code for this CPCI will be created by the system integration test team by using defined IISS Software Configuration Management procedures. This CPCI will use the COBOL language compilers.

3.9 Adaptation Data

This CPCI has been coded using ANSI COBOL, FORTRAN and a "standard" subset of the "C" languages. The intent was to provide a transportable system. Any system environment supporting these languages, a virtual memory management scheme, the COMM and NTM subsystems of IISS and the ORACLE Database Management System should be able to support this CPCI. Every possible attempt has been made to localize and identify any machine or environment dependent modules through the original design of the IISS and application of Configuration Management Procedures.

3.10 Detail Design Description

The following sections have been computer generated for this CPCI.

3.10.1 Main Program List

The following is a list of all "Main Programs" which are modules that are not called by any other module being documented here. These modules are either program entry points

PS 620141255
1 November 1985

or, if they are hooked into another set of programs via subroutine calls, they are the points the external programs can call and therefore enter through. To differentiate between the two types of entry points, look at the individual Module Documentation (section 3.10.8) and look at Module Type for each of the Main Program modules listed. Note whether the routine is a Program, Subroutine, or Function. If it is a Program, it is truly a main program entry point. If not, then it is merely called by other programs not being documented here.

PS 620141255
1 November 1985

GENERATE CODASYL RP Main Program List

Module Name -----	Purpose -----
CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE

PS 620141255
1 November 1985

3.10.2 Module List

The following is a list of all the modules being documented here along with their purpose. Each module has a unique name, no matter what language it was written in.

PS 620141255
1 November 1985

GENERATE CODASYL RP Module List

Module Name -----	Purpose -----
CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE

PS 620141255
1 November 1985

3.10.3 External Routines List

The following is a list of all routines or functions not documented here that are called by modules that are documented here. The first caller, in alphabetical order, is listed as well. The specification in which any module is documented may be found in the Module Documentation Index (Document Number CM 620100001). See section 3.10.6 for a list of the modules that call each of these external routines.

PS 620141255
1 November 1985

GENERATE CODASYL RP External Routines List

Module Name	First User
-----	-----
CDCI	CDQPC
CDCWF	CDQPC
CDIC	CDQPC
CDMACR	CDQPC
CDMSG	CDQPC
CDPRM	CDQPC
CDQDF	CDQPC
CDQPOP	CDQPC
CDRDF	CDQPC
CDRFT	CDQPC
ERRPRO	CDQPC
GENFIL	CDQPC
RPTERR	CDQPC

3.10.4 Include File List

The following is a list of all include files called in by modules being documented here. Each include file has a unique name regardless of the language being used. The purpose of each include file is listed as well. A more complete description of each include file is given in section 3.10.9. The purpose listed is the one that is in the source code of the include file.

A purpose of "***** PURPOSE NOT FOUND BY STRIPPER *****" indicates that a purpose statement was not written into the include file itself. The most common reason for this is that the include file comes from system libraries that were not developed by the project, such as 'C' libraries that are provided with the 'C' compiler.

See section 3.10.6 for a set of lists which show all the modules which call in each of these include files.

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File List

File Name	Purpose
-----	-----
APGC	GENERIC CODASYL COMMAND TABLE
APINFO	ACCESS PATH INFORMATION TABLE
APRK	TABLE OF RECORD KEYS FOR CODASYL ACCESS PATHS
COBLINE	COBOL SOURCE CODE LINE DESCRIPTION
COBOLOP	WORKING STORAGE VARIABLES OPERATOR TRANSLATION
CONFLD	WORKING STORAGE FOR CONVERSION OF VARIABLES
COPGEN	**** PURPOSE NOT FOUND BY STRIPPER ****
CSAL	CONCEPTUAL SCHEMA ACTION LIST
CSQUAL	CONCEPTUAL SCHEMA QUALIFY LIST
ERRCDM	IISS ERROR STATUS CODES FOR CDM MODULES
ERRORST	WS DEFINITION FOR ERROR STATUS
ERRPRO	PROCESS ERROR INCLUDE FILE
FILSTAT	VARIABLE DEFINITION FOR FILE STATUS
INSTTBL	TABLE CONTAINING ALL GENERIC CODASYL COMMANDS
ISAL	INTERNAL SCHEMA ACTION LIST
ISQUAL	INTERNAL SCHEMA QUALIFY LIST
ORCLEDA	WS DEFINITION FOR THE ORACLE LOGIN AREA
QPG02	WS FOR REQUEST PROCESSOR GENERATOR
QPG2FD	WS DEFINITIONS FOR A FILE DESCRIPTION
QPGCMIN	CALLS THE MACRO COPY FACILITY
RFTABLE	THE RESULT FIELD TABLE
SBSTLST	WS DEFINITION FOR THE SUBSTITUTION LIST TABLE
TMVALUE	WS DEFINITION FOR TEMPORARY VALUE

PS 620141255
1 November 1985

3.10.5 Where Include File Used List

The following lists each include file from 3.10.4 and all the modules documented in this specification which include them. The purpose of each module is listed as well.

PS 620141255
1 November 1985

GENERATE CODASYL RP Where-include-file-used List

Include File -----	Module Name -----	Module Purpose -----
APGC	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
APINFO	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
APRK	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
COBLINE	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
COBOLOP	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CONFLD	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE

PS 620141255
1 November 1985

GENERATE CODASYL RP Where-include-file-used List

Include File -----	Module Name -----	Module Purpose -----
COPGEN	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CSAL	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CSQUAL	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
ERRCDM	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
ERRORST	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
ERRPRO		

PS 620141255
1 November 1985

GENERATE CODASYL RP Where-include-file-used List

Include File -----	Module Name -----	Module Purpose -----
	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
FILSTAT	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
INSTTBL	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
ISAL	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
ISQUAL	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
ORCLEDA	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE

PS 620141255
1 November 1985

GENERATE CODASYL RP Where-include-file-used List

Include File -----	Module Name -----	Module Purpose -----
QPG02	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
QPG2FD	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
QPGCMIN	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
RFTABLE	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
SBSTLST	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
TMVALUE		

PS 620141255
1 November 1985

GENERATE CODASYL RP Where-include-file-used List

Include File -----	Module Name -----	Module Purpose -----
	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE

PS 620141255
1 November 1985

3.10.6 Where External Routine Used List

The following lists each external function or routine listed in 3.10.3 and all the documented modules which call it. The purpose of each module is listed as well.

PS 620141255
1 November 1985

GENERATE CODASYL RP Where-external-routine-used List

System Module -----	Module Name -----	Module Purpose -----
CDGI	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDCWF	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDIC	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDMACR	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDMSG	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDPRM	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDQDF	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE

PS 620141255
1 November 1985

GENERATE CODASYL RP Where-external-routine-used List

System Module -----	Module Name -----	Module Purpose -----
CDQPOP	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDRDF	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
CDRFT	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
ERRPRO	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
GENFIL	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
RPTERR	CDQPC	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE

3.10.7 Main Program Parts List

The following lists each Main Program listed in 3.10.1 and all the modules which are called either by that module itself or by any of the documented modules which it calls. It is possible for a non-main module to be listed more than once if it is called by multiple modules. The called modules, in this case known as program parts, are marked as to whether they are documented here. If so, the phrase "well-defined module" appears by the module name, if not it is an "external routine". The Purpose of the Main Program module is listed as well.

PS 620141255
1 November 1985

GENERATE CODASYL RP Main Program Parts List

Main Pgm Name -----	Module Name -----	Module Type -----
CDQPC	Purpose--	GENERATE REQUEST PROCESSOR FOR CODASYL DATA BASE
	GDCI	External routine
	GDCWF	External routine
	GDIC	External routine
	CDMACR	External routine
	CDMSG	External routine
	CDPRM	External routine
	GDQDF	External routine
	GDQPOP	External routine
	CDRDF	External routine
	CDRFT	External routine
	ERRPRO	External routine
	GENFIL	External routine
	RPTERR	External routine

3.10.8 Module Documentation

The following documentation describes information which is specific to each individual module being documented in this specification as listed in section 3.10.2. It provides a compact way of getting information that would be otherwise buried within each module's source code.

The specific items in this module documentation have the following meanings:

NAME:	Name of program Module.
PURPOSE:	Purpose of Module as detailed in the source code.
LANGUAGE:	Programming language source code is written in. The choices are: VAX-11 FORTRAN C (I/S-1 Workbench 'C') VAX-11 COBOL
MODULE TYPE:	Whether a Program, Subroutine, or Function.
SOURCE FILE:	Name of Source File from file specification.
SOURCE FILE TYPE:	Source File Extension from file specification.
HOST:	Whether this is a host-dependent routine (VAX or IBM) or blank if host-independent.
SUBSYSTEM:	IISS sub-system this file resides in.
SUBDIRECTORY:	Sub-directory of that subsystem in which this file resides.
DOCUMENTATION GROUP:	Name of documentation group of which this source file is a member.
DESCRIPTION:	A description of the module as obtained

PS 620141255
1 November 1985

from the source code.

ARGUMENTS: The arguments with which this routine is called if it is a Subroutine or a Function.

INCLUDE FILES: A list of all the files that are included into this module as well as their purposes.

ROUTINES CALLED: Subroutines or Functions, either documented or external, called by this module, if any.

CALLED DIRECTLY BY: The documented routines which call this module, if any.

USED IN MAIN PROGRAM(S): The documented Main Programs which contain this module in their parts list according to the list in section 3.10.7.

The Module Documentation is arranged alphabetically according to Module Name.

PS 620141255
1 November 1985

GENERATE CODASYL RP Module Documentation

NAME: CDQPC
PURPOSE: GENERATE REQUEST PROCESSOR FOR CODASYL
DATA BASE
LANGUAGE: VAX-11 COBOL
MODULE TYPE: SUBROUTINE
SOURCE FILE: CDQPC
SOURCE FILE TYPE: .COB
HOST:
SUBSYSTEM: CDM
SUBDIRECTORY:
DOCUMENTATION GROUP: PS41255

DESCRIPTION:

- CDQPC IS THE PROGRAM WHICH GENERATES THE ACTUAL COBOL
CODE FOR CODASYL LIKE QUERY PROCESSOR NEEDED.
THIS IS A SEPARATE PROGRAM STARTED BY THE
CDM PRECOMPILER WHEN A CODASYL QUERY PROCESSOR CAN BE
GENERATED. IT PRODUCES AN OUTPUT FILE WHICH
MUST BE COBOL COMPILED ON THE CORRECT MACHINE
THE GENERATED SOURCE CODE WILL INCLUDE COPY STATEMENTS.

ARGUMENTS:

QPGC-DBID = DSPLY [9(5)]
QPGC-DBMS-NAME = DSPLY [X(30)]
DB-SCHEMA = DSPLY [X(30)]
DB-SUB-SCHEMA = DSPLY [X(30)]
DB-LOCATION = DSPLY [X(30)]
DBMS-LIB = DSPLY [X(30)]
HOST = DSPLY [X(3)]
MY-HOST = DSPLY [X(3)]
QPGC-QPID = DSPLY [X(10)]
QPGC-SUBTRANS = DSPLY [999]
IS-ACTION-LIST = RECRD
IS-QUALIFY-LIST = RECRD
CS-ACTION-LIST = RECRD
CS-QUALIFY-LIST = RECRD
RFT = RECRD
GC-TABLE = RECRD
RECORD-KEY-TABLE = RECRD

PS 620141255
1 November 1985

AP-INFO-TABLE = RECRD
ORACLE-LDA = RECRD
ERRO-FILE = DSPLY [X(5)]
GEN-FILE-NAME = DSPLY [X(30)]
RETURN-STATUS = DSPLY [X(5)]

INCLUDE FILES:

QPGO2 - WS FOR REQUEST PROCESSOR GENERATOR
ERRCDM - IISS ERROR STATUS CODES FOR CDMF MODULES
FILSTAT - VARIABLE DEFINITION FOR FILE STATUS
INSTTBL - TABLE CONTAINING ALL GENERIC CODASYL COMMANDS
QPG2FD - WS DEFINITIONS FOR A FILE DESCRIPTION
COBLINE - COBOL SOURCE CODE LINE DESCRIPTION
CONFLD - WORKING STORAGE FOR CONVERSION OF VARIABLES
COBOLOP - WORKING STORAGE VARIABLES OPERATOR TRANSLATION
ERRORST - WS DEFINITION FOR ERROR STATUS
TMVALUE - WS DEFINITION FOR TEMPORARY VALUE
SBSTLST - WS DEFINITION FOR THE SUBSTITUTION LIST TABLE
ORCLEDA - WS DEFINITION FOR THE ORACLE LOGIN AREA
APINFO - ACCESS PATH INFORMATION TABLE
APGC - GENERIC CODASYL COMMAND TABLE
APRK - TABLE OF RECORD KEYS FOR CODASYL ACCESS PATHS
CSAL - CONCEPTUAL SCHEMA ACTION LIST
CSQUAL - CONCEPTUAL SCHEMA QUALIFY LIST
ISQUAL - INTERNAL SCHEMA QUALIFY LIST
ISAL - INTERNAL SCHEMA ACTION LIST
RFTABLE - THE RESULT FIELD TABLE
QPGCMIN - CALLS THE MACRO COPY FACILITY
COPGEN - **** PURPOSE NOT FOUND BY STRIPPER ****
ERRPRO - PROCESS ERROR INCLUDE FILE

ROUTINES CALLED:

GENFIL
CDRFT
CDCWF
CDQDF
CDMSG
CDRDF
CDPRM
CDMACR
CDCI
CDIC
CDQPOP

PS 620141255
1 November 1985

RPTERR
ERRPRO

PS 620141255
1 November 1985

3.10.9 Include File Descriptions

The following list contains a purpose and description of each include file listed in 3.10.4 as specified in the source code. The language it is written in is also given.

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: APGC
PURPOSE: GENERIC CODASYL COMMAND TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

HOLDS THE GENERIC CODASYL DML COMMANDS FOR AN
ACCESS PATH OF A NDML REQUEST

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: APINFO
PURPOSE: ACCESS PATH INFORMATION TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THIS IS A COLLECTION OF INFORMATION STORED IN A
NUMBER OF VARIOUS TABLES USED BY THE ACCESS PATH TABLE
AND THE GENERIC CODASYL TABLE. SEE CDMP SPEC, PRE6

APINFO.INC

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: APRK
PURPOSE: TABLE OF RECORD KEYS FOR CODASYL ACCESS PATHS
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS INFORMATION FOR THE KEYS OF
RECORDS CONTAINED IN THE CURRENT ACCESS
PATH

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: COBLINE
PURPOSE: COBOL SOURCE CODE LINE DESCRIPTION
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THIS WORKING STORAGE DESCRIPTION IS USED
IN GENERATING COBOL SOURCE CODE

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: COBOLOP
PURPOSE: WORKING STORAGE VARIABLES OPERATOR TRANSLATION
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: CONFLD
PURPOSE: WORKING STORAGE FOR CONVERSION OF VARIABLES
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: CSAL
PURPOSE: CONCEPTUAL SCHEMA ACTION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

TABLE TO HOLD CONCEPTUAL DATA ABOUT THE REQUEST

***** THE CONCEPTUAL SCHEMA ACTION LIST

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: CSQUAL
PURPOSE: CONCEPTUAL SCHEMA QUALIFY LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS CONCEPTUAL SCHEMA INFORMATION FOR
THE REQUESTS QUALIFICATION

THE CONCEPTUAL SCHEMA QUALIFY LIST

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: ERRCDM
PURPOSE: IISS ERROR STATUS CODES FOR CDMP MODULES
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS ALL ERROR CODES USED BY CDMP *
MODULES FOR ERROR HANDLING *

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: ERRORST
PURPOSE: WS DEFINITION FOR ERROR STATUS
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

ERROR STATUS VARIABLE

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: ERRPRO
PURPOSE: PROCESS ERROR INCLUDE FILE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: FILSTAT
PURPOSE: VARIABLE DEFINITION FOR FILE STATUS
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

FILE USAGE FILE STATUS PARAMETER

FILSTAT

FILE USAGE FILE STATUS PARAMETER

SIZE AND THE 88 VALUE ARE PROBABLY MACHINE
DEPENDENT

(THIS IS FOR VAX-11 COBOL)

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: INSTTBL
PURPOSE: TABLE CONTAINING ALL GENERIC CODASYL COMMANDS
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

DECODE FOR THE GENERIC CODASYL COMMANDS

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: ISAL
PURPOSE: INTERNAL SCHEMA ACTION LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS INTERNAL SCHEMA INFORMATION ABOUT AN
NDML REQUEST

THE INTERNAL SCHEMA ACTION LIST

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: ISQUAL
PURPOSE: INTERNAL SCHEMA QUALIFY LIST
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS INTERNAL SCHEMA INFORMATION FOR AN
NDML QULIFICATION

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: ORCLEDATA
PURPOSE: WS DEFINITION FOR THE ORACLE LOGIN AREA
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

THE ORACLE LOGON DATA AREA

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: QPG02
PURPOSE: WS FOR REQUEST PROCESSOR GENERATOR
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: QPG2FD
PURPOSE: WS DEFINITIONS FOR A FILE DESCRIPTION
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: QPGCMIN
PURPOSE: CALLS THE MACRO COPY FACILITY
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: RFTABLE
PURPOSE: THE RESULT FIELD TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

CONTAINS CONCEPTUAL SCHEMA INFORMATION ABOUT
THE RESULTS OF AN NDML REQUEST

THE RESULT FIELD TABLE

WHEN CHANGING THE STRUCTURE OF THIS TABLE
BE SURE TO CHANGE THE LAYOUT IN THE
LINKAGE SECTION OF THE DRS (CDS01)
WHICH WAS COPIED FROM THIS.

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: SBSTLST
PURPOSE: WS DEFINITION FOR THE SUBSTITUTION LIST TABLE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

SUBSTITUTION-LIST REPRESENTS THE INPUT TABLE
OF SUBSTITUTION PARAMETERS FOR THE CDMACR
MACRO EXPANSION SUBROUTINE

PS 620141255
1 November 1985

GENERATE CODASYL RP Include File Description

FILE NAME: TMVALUE
PURPOSE: WS DEFINITION FOR TEMPORARY VALUE
LANGUAGE: VAX-11 COBOL

DESCRIPTION:

3.10.10 Hierarchy Chart

The following hierarchy charts show the relationships between all of the modules mentioned in the above documentation. A module may call a subroutine several times within its code, but the call will only be shown once as a single relationship on this hierarchy chart. All modules shown at the top of the first page are considered Main Programs as described in section 3.10.1 above.

There is an internal paging scheme as marked by the numbers in the upper right corner of each page. An index after the last page of the chart shows where a routine and its calls are first defined. If a routine has no page reference, it either makes no calls or is an external routine. A continuation box on the end of a tree limb shows where that the tree continues on the page numbered mentioned. A number in a box with a routine name points to the page where the routine is further defined within the hierarchy tree. If there is no number in a box, the routine either makes no calls or is an external routine.

PS 620141255
1 November 1985

1

```
      +-----+
      | CDQPC |
      +-----+
      |
+-----+-----+-----+-----+-----+-----+
| | | | | | |
+-----+ +-----+ +-----+ +-----+ +-----+ +-----+
| GENFIL | | CDRFT | | CDCWF | | CDQDF | | CDMSG | | (CONT) |
+-----+ +-----+ +-----+ +-----+ +-----+ +-----+
                                         +-----2+
```

PS 620141255
1 November 1985

2

```
      +-----+  
      |CDQPC|  
      +-----+  
      |  
+-----+-----+-----+-----+-----+  
|         |         |         |         |         |  
+-----+ +-----+ +-----+ +-----+ +-----+ +-----+  
|(CONT)| |CDRDF| |CDPRM| |CDMACR| |CDGI| |(CONT)|  
+-----1+ +-----+ +-----+ +-----+ +-----+ +-----3+
```

PS 620141255
1 November 1985

3

```
      +-----+  
      |CDQPC|  
      +-----+  
      |  
+-----+  
|         |         |         |         |  
+-----+ +-----+ +-----+ +-----+ +-----+  
|(CONT)| |CDIC| |CDQPOP| |RPTERR| |ERRPRO|  
+-----+ +-----+ +-----+ +-----+ +-----+  
+-----2+
```

PS 620141255
1 November 1985

CDCI
CDCWF
CDIC
CDMACR
CDMSG
CDPRM
CDQDF
CDQPC.....1
CDQPOP
CDRDF
CDRFT
ERRPRO
GENFIL
RPTERR

PS 620141255
1 November 1985

3.11 Program Listings Comments

This information is contained in the Module Descriptions in section 3.10.

SECTION 4
QUALITY ASSURANCE PROVISIONS

4.1 Introduction and Definitions

"Testing" is a systematic process that may be preplanned and explicitly stated. Test techniques and procedures may be defined in advance, and a sequence of test steps may be specified. "Debugging" is the process of isolation and correction of the cause of an error.

"Antibugging" is defined as the philosophy of writing programs in such a way as to make bugs less likely to occur and when they do occur, to make them more noticeable to the programmer and the user. In other words, as much error checking as is practical and possible in each routine should be performed.

4.2 Computer Programming Test and Evaluation

The quality assurance provisions for test consists of the normal testing techniques that are accomplished during the construction process. They consist of design and code walk-throughs, unit testing, and integration testing. These tests are performed by the design team. Structured design, design walk-through and the incorporation of "antibugging" facilitate this testing by exposing and addressing problem areas before they become coded "bugs."

